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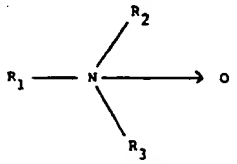
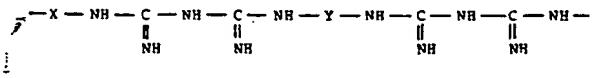
(54) Food industry sanitiser composition

(57) A sanitising composition for use in the food industry comprises at least one amine oxide of the general formula



wherein R_1 represents an alkyl or alkenyl radical of 8 to 24 carbon atoms, or a radical of the formula:

wherein R_4 is as defined under R_1 and R_5 represents an alkylene radical of 1 to 5 carbon atoms, and each of R_2 and R_3 represents an optionally hydroxylated alkyl, alkoxy or alkylpolyalkoxy radical in which each alkyl or alkoxy moiety contains 1 to 4 carbon atoms, or an aryl, aralkyl or alkaryl radical in which each alkyl radical contains 1 to 4 carbon atoms; and at least one polymeric biguanide which possesses a recurring polymer unit



wherein each X and each Y represents an alkylene radical of 3 to 12 carbon atoms, or X and Y represent bridging groups in which, taken together, the total number of carbon atoms directly interposed (as herein defined) between the pairs of chain nitrogen atoms linked by X and Y is from 10 to 16, or an inorganic or organic acid addition salt thereof.

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Formulae in the printed specification were reproduced from drawings submitted after the date of filing, in accordance with Rule 20(14) of the Patents Rules 1982.

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FOOD INDUSTRY SANITISER

This invention relates to compositions used for sanitising in the food and beverage industries.

It is well known that it is necessary to kill bacteria, fungi and yeasts in vessels, benches and vats and the like used during the manufacture of foodstuffs and beverages as well as in bottles and other containers for these products. This is sometimes known as hard surface sanitising.

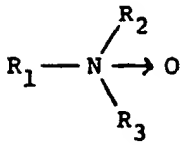
If a sanitising composition is to be effective for this purpose it must have a broad spectrum activity. Further, since it is desirable to use a sanitiser which does not have to be rinsed off it is necessary to have a formulation which does not affect the foodstuff or beverage which is placed in the container which has been sanitised. This presents particular problems in breweries where the sanitiser must not only not contaminate the beer but also must have no effect on the head, clarity and taste of the beer.

Among the many materials which have been used for this purpose, polymeric biguanides have been promoted for this purpose. However, while such polymers are effective against bacteria and yeasts they tend not to be sufficiently effective against fungi. Accordingly, there

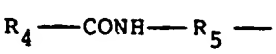
is a need for a sanitiser which is effective simultaneously against fungi as well as bacteria and yeasts. A particular problem with the polymeric biguanides is that they generally lack compatibility with the materials which one might contemplate using in combination with them in order to make the formulation have a broader spectrum of activity, in particular against fungal infections. Thus benzimidazole surfactants as well as a wide range of naturally occurring preservatives such as citric acid, sodium benzoate, l-ascorbic acid, sodium tartrate and l-histidine are either incompatible with polymeric biguanides or they are inactivated on being blended with them or their mode of action is too slow. While organometallic species are generally effective anti-fungal agents they are, of course, totally unacceptable in the food and beverage industries on account of their toxicity.

It has now surprisingly been found, according to the present invention, that effective sanitising compositions can be obtained by combining a polymeric biguanide with certain amine oxides. It has been found that such formulations are stable while having broad spectrum anti-microbial activity against a wide range of bacteria, fungi and yeasts. In addition, such formulations are compatible with, in particular, beer. According to the present invention there is provided a composition suitable for use as a sanitiser which comprises at least one amine

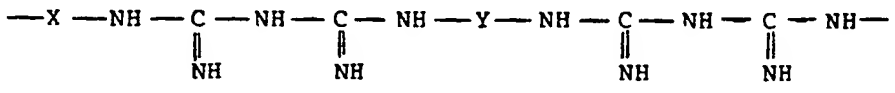
oxide of the general formula:



wherein R_1 represents an alkyl or alkenyl radical of 8 to 24 carbon atoms, for example 8 to 20 carbon atoms and especially 12 to 18 carbon atoms, or a radical of the formula:



wherein R_4 is as defined under R_1 and R_5 represents an alkylene radical of 1 to 5 carbon atoms, and each of R_2 and R_3, which may be the same or different, represents an optionally hydroxylated alkyl, alkoxyalkyl, or alkylpolyalkoxyalkyl radical e.g. a hydroxy alkyl radical, in which each alkyl or alkoxy moiety contains 1 to 4, especially 1 or 2, carbon atoms, or an aryl, aralkyl or alkaryl radical in which each alkyl radical contains 1 to 4, especially 1 or 2, carbon atoms; and at least one polymeric biguanide which possesses a recurring polymer unit of the formula:



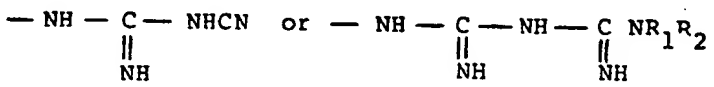
wherein each X and each Y, which may be the same or different, represents an alkylene radical of 3 to 12 carbon atoms, or X and Y, which may be the same or different, represent bridging groups in which, taken together, the total number of carbon atoms directly interposed (as defined herein) between the pairs of chain nitrogen atoms linked by X and Y is from 10 to 16, or an inorganic or organic acid addition salt thereof.

The preferred amine oxides used in the present invention are ones in which R_1 represents an alkyl radical of 12 to 18 carbon atoms, especially 14 carbon atoms. R_2 and R_3 preferably represent methyl, ethyl, hydroxymethyl and hydroxyethyl radicals, especially methyl radicals. The compound in which R_1 is $C_{14}H_{29}$ and R_2 and R_3 are both methyl is particularly preferred. This material is commercially available as a 30% by weight aqueous solution from Millmaster Onyx as "Ammonyx MO". It will, of course, be appreciated that, frequently, the amine oxides are in the form of mixtures of compounds which differ from one another in that R_1 has different chain lengths.

The polymeric biguanides can be used either as a free base or in the form of a salt with an inorganic or organic acid. Typical inorganic salts include hydrochlorides, carbonates, sulphates, phosphates, nitrates, hydrobromides, metaphosphates and hexametaphosphates while typical organic acid salts include formates, benzoates, acetates, stearates, laurates, dihydroacetates, phthalates, sebacates, behenates,

gluconates, cinnamates, oleates, paratholuenesulphonates, adipates, citrates, succinates, caprylates, tartrates, glycolates, malates, lactates, trichloroacetates, malonates, myristates and maleates. Hydrochlorides are particularly preferred.

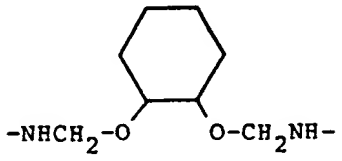
In general, the polymeric biguanides comprise a mixture of polymers having different chain lengths. Typically, the polymer will contain 3 to 80 polymer units as set out above, the polymer chains being terminated by an amino group or a group of the formula:



wherein R_1 represents hydrogen or a substituted or unsubstituted aliphatic, cycloaliphatic, araliphatic or aromatic hydrocarbon radical containing from 1 to 18 carbon atoms and R_2 represents a substituted or unsubstituted aliphatic, cycloaliphatic, araliphatic or aromatic hydrocarbon radical containing from 1 to 18 carbon atoms.

The radicals X and Y are typically alkylene chains which may contain chain hetero atoms, for example, oxygen, sulphur or nitrogen. However, other bridging groups are possible, these being saturated or unsaturated and may, if desired, incorporate cyclic nuclei. In this

instance, the expression "carbon atoms directly interposed", as used herein, means the number of carbon atoms along the shortest pathway between adjacent X and Y radicals. Thus, the number of carbon atoms directly interposed between the nitrogen atoms in the group



is 4 and not 8.

Preferred polymeric biguanides used in the present invention are those where X and Y are the same and represent an alkylene radical of 6 carbon atoms, the polymer containing generally 4 to 10 recurring units. The average molecular weight of the polymer is thus typically about 1,000 to 2,000. A particularly preferred such material is the hydrochloride salt which is commercially available as a 20% by weight aqueous solution; it is obtainable from I.C.I. under the trade mark "VANTOCIL 1B". Details regarding the preparation of polymeric biguanides can be found, for example, in GB-A-1434040.

It will be appreciated that the relative proportions of the two active ingredients in the

formulation will depend to some extent on the microbiological flora to be treated. Typically, however, the amine oxide is in excess. Typically, the weight rati of polymer to amine oxide will be from 1:1 to 1:90, for example 1:7 to 1:20 and especially 1:12 to 1:16.

The compositions will generally contain from 1 ppm to 50 % by weight of the active ingredients taken together and preferably from 1% to 20% by weight.

The compositions of the present invention will generally be aqueous and can be obtained by simple blending of the active ingredients with water or of aqueous solutions of the active ingredients with water.

The following Examples further illustrate the present invention.

EXAMPLES

The following formulations were evaluated against typical bacteria, fungi, and yeasts found in the food and beverage industries.

Formulation A	:	3%	Vantocil IB (20% active)
		97%	Water
Formulation B	:	30%	Ammonyx MO (30% active)
		70%	Water

Formulation C	:	3% Vantocil IB
		30% Ammonyx MO
		67% Water
Formulation D	:	5% Vantocil IB
		40% Ammonyx MO
		55% Water

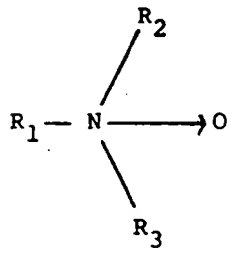
The results in terms of percentage kill are given in Table 1. These show that Formulation A is effective against bacteria and yeast but is ineffective against fungi, Formulation B is ineffective against bacteria and has only limited effetiveness against fungi and yeasts, but in combination, particularly as in Formulation D, the active ingredients are effective against bacteria, fungi and yeasts.

TABLE 1

Classification	Species	Product Conc.	Contact Time	% Kill for Formulation A	B	C	D
Bacteria	Escherichia coli	50 ppm	1 hr	99.9	39.5	53%	95.9%
Bacteria	Salmonella typhimurium	50 ppm	1 hr	99.9	40.1	99.9%	99.9%
Bacteria	Staphyloccoccus aureus	50 ppm	1 hr	95.7	28.2	99.9%	100%
Fungi	Aspergillus niger	1500 ppm	2 hr	38.9	66.7	84%	84%
Fungi	Aspergillus flavus	1500 ppm	2 hr	15.0	77.3	97.6%	96.4%
Yeast	Torulopsis candida	100 ppm	1 hr	98.60	63.9	98.5%	99.9%
Yeast	Saccharomyces cerevisiae	100 ppm	1 hr	98.00	42.00	42.4%	99.9%

CLAIMS

1. A composition suitable for use as a sanitiser which comprises at least one amine oxide of the general formula

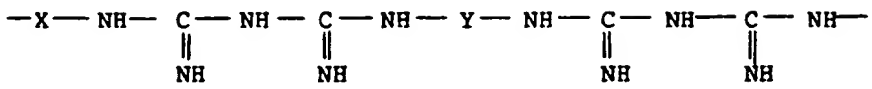


wherein R_1 represents an alkyl or alkenyl radical of 8 to 24 carbon atoms, or a radical of the formula:

$$R_4 - CONH - R_5 -$$

wherein R_4 is as defined under R_1 and R_5 represents an alkylene radical of 1 to 5 carbon atoms, an each of R_2 and R_3, which may be the same or different, represents an optionally hydroxylated alkyl, alkoxy or alkylpolyalkoxy radical in which each alkyl or alkoxy moiety contains 1 to 4 carbon atoms, or an aryl, aralkyl or alkaryl radical in which each alkyl radical contains 1 to 4 carbon atoms; and at least one polymeric buguanide which possesses a

recurring polymer unit of the formula



wherein each X and each Y, which may be the same or different, represents an alkylene radical of 3 to 12 carbon atoms, or and Y, which may be the same or different, represent bridging groups in which, taken together, the total number of carbon atoms directly interposed (as herein defined) between the pairs of chain nitrogen atoms linked by X and Y is from 10 to 16, or an inorganic or organic acid addition salt thereof.

2. A composition according to claim 1 in which R_1 represents an alkyl radical having 12 to 18 carbon atoms.

3. A composition according to claim 2 in which R_1 represents an alkyl radical having 14 carbon atoms.

4. A composition according to any one of claims 1 to 3 in which R_2 and R_3 represent an alkyl or hydroxyalkyl radical having 1 to 4 carbon atoms.

5. A composition according to claim 4 in which R_2 and R_3 represent methyl radicals.

6. A composition according to any one of the preceding claims in which X and Y represent alkylene chains.

7. A composition according to claim 6 in which X and Y represent alkylene chains having 6 carbon atoms.

8. A composition according to any one of the preceding claims in which the polymer contains 4 to 10 recurring units.

9. A composition according to any one of these preceding claims in which the polymer is in the form of a hydrochloride.

10. A composition according to any one of the preceding claims in which the weight ratio of polymer to amine oxide is from 1 : 1 to 1 : 90.

11. A composition according to claim 10 in which the weight ratio of polymer to amine oxide is from 1 : 12 to 1 : 16.

12. A composition according to any one of the preceding claims which contains from 1ppm to 50% by weight of the polymer and amine oxide, taken together, in agueous solution.

13. A composition according to claim 12 which contains from 1% to 20% by weight of the polymer and amine oxide, taken together.

14. A composition according to claim 1 substantially as described in any one of the Examples.

15. A method of sanitising vessels, containers, benches and other work surfaces used during the manufacture of food-stuffs and beverages which comprises applying thereto a composition as claimed in any one of the preceding claims.

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